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FACULTY OF ENGINEERING AND TECHNOLOGY

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COURSE: CEF 440 - Internet Programming and Mobile Programming

TASK2: REQUIREMENT GATHERING of the biometric student's attendance app

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INTRODUCTION

When comes to developing a mobile application, looking at the requirements of the system is a crucial step for the codebase of our application. Here we aim to document the requirements for the development of the biometric student's attendance application. The system intends to provide an accurate and efficient method of tracking student attendance using biometric authentication techniques. This report will outline the requirements gathering of our biometric student's attendance mobile application, which is part of the Software Requirements Specification document in software development.

An SRS is a document that describes what the software will do and how it will be expected to perform. It also describes the functionality the product needs to fulfill the needs of all stakeholders (business, users). Here, we are going to DEFINE the purpose of our product, DESCRIBE what we are building, DETAIL the individual requirements, and DELIVER it for approval.

1. Project description and understanding the business need.

During the requirement gathering phase, various methods and techniques can be used to capture requirements effectively at different stage like system requirements, technical requirements and business requirements. These included: surveys, interviews, focus groups, personas, brainstorming, user stories, prototype and user journeys.

Surveys: Surveys involve creating questionnaires that are distributed to a target audience to gather feedback and opinions. Surveys can provide quantitative data by asking closed-ended questions concerning what they would like to see if ever the biometric student's app exist, which functionalities they would like to perform into the app, with predefined answer choices. They are useful for collecting a large amount of information from a wide range of users. This can be done using tools such as google forms, Microsoft forms.

Interviews: involve one-on-one conversations with individual users or stakeholders. They allow for more in-depth discussions and provide qualitative insights. Interviews can be structured or unstructured, depending on the level of formality and the specific goals of the conversation. Tools: zoom, Microsoft Teams, google meet, skype

Focus Groups: Focus groups involve gathering a small group of users (typically 6-10 people) to discuss specific topics or provide feedback. A moderator guides the group discussion, and participants can share their thoughts, opinions, and experiences related to the mobile application. Focus groups can generate valuable insights and encourage participants to build upon each other's ideas. Tools: zoom, Microsoft Teams, google meet.

Personas: Personas are fictional representations of specific user types or archetypes. They help to create a shared understanding of the target users by describing their characteristics, goals, motivations, and behaviors. Personas are developed based on user research data and insights and are used as a reference point throughout the design and development process. Tools: Lucidchart, Adobe XD.

Brainstorming: it is a collaborative technique that encourages participants to generate ideas and solutions creatively. It involves a group discussion where participants freely express their thoughts and suggestions without judgment. Brainstorming sessions can help uncover innovative ideas for features, functionalities, and user experiences.

User Stories: User stories are concise descriptions of a specific feature or functionality from the perspective of an end user. They typically follow a simple template: "As a [user], I want [goal] so that [benefit]." User stories help capture user requirements in a user-centered manner and serve as a basis for prioritizing and planning development tasks. Tool: Microsoft whiteboard.

User Journeys: User journeys, also known as customer journeys or user flows, depict the step-by-step experiences of users as they interact with the mobile application. User journeys illustrate the different touchpoints, actions, and interactions users have within the application. They help identify pain points, opportunities for improvement, and areas where user requirements need to be addressed. Tool: Lucidchart, overflow.

Prototypes: of the mobile application were developed to visualize and demonstrate proposed features and functionalities. Stakeholders were able to interact with the prototypes, providing feedback on usability, layout, and design aspects. Tool: Figma.

1.1. Product perspective

The biometric student's attendance mobile application is designed to run as a standalone system. It will interact with the existing student attendance management system, which will include database and backend infrastructures. The mobile application will provide a convenient and secure way for students to mark their attendance using biometric authentication. This project aims to use biometric technology, specifically fingerprint recognition, to create a secure and reliable system for recording student attendance. The mobile application will provide an intuitive interface for both students and instructors, allowing for seamless attendance tracking in classrooms, lecture halls, and other academic settings.

1.2. Product features

- Biometric Authentication: The application will use fingerprints as biometric technology for verifying the identity of students.
- Attendance Marking: Students will be able to mark their attendance by scanning their biometric data through the mobile application.
- Real-time Data Synchronization: The attendance data captured through the mobile application will be synchronized in real-time with the central attendance management system.

- Notifications: The application may provide notifications to students about their attendance status, upcoming classes, or any other relevant information.
- Reporting and Analytics: The system may generate attendance reports and provide analytics to track attendance patterns and find trends.
- User Management: The application will support user management functionalities, including student registration, profile management, and access control.

1.3. Operating environment:

- Mobile Platforms: The application will be developed for popular mobile platforms such as iOS and Android.
- Network Connectivity: The application will require an internet connection for real-time synchronization with the central attendance management system.

1.4. Design and implementation constraints:

- Security considerations: The application must adhere to security best practices to ensure the privacy and integrity of biometric data and attendance records.
- Compatibility: The application should be compatible with a range of mobile devices and operating system versions to accommodate a diverse user base.

1.5. User needs and documentation

- Each user will need to register into the system.
- Students will be able to register their fingerprint and associate it to their account.
- Instructors will be able to create different sections/courses for them to track student's attendance, get notifications.
- The admin will be able to insert lecturers in the system.

1.6. Assumptions and dependencies:

- Existing Infrastructure: The mobile application assumes the availability of a backend infrastructure, including a database and APIs, to store and retrieve attendance data.
- Biometric Technology Integration: The application depends on the successful integration of biometric authentication technology within the mobile platform.

2. Project Objectives:

In today's higher educational institutions, managing student attendance effectively is crucial for monitoring participation and ensuring accountability. Traditional methods, like manual roll calls, are often time-consuming, error-prone, and susceptible to manipulation. This project proposes the development of a Biometric Student's Attendance Mobile Application to address these concerns.

This mobile application leverages fingerprint recognition technology to create a secure and reliable system for students to mark their attendance. Students will benefit from a convenient and user-friendly interface, dropping the need for physical attendance sheets. Instructors gain the advantage of real-time attendance tracking, allowing them to watch student participation effectively and identify any discrepancies promptly. The application is designed for scalability and customization, catering to various class sizes and institutional needs. Additionally, the application prioritizes security, employing robust measures to protect student data, particularly sensitive biometric information.

The primary goals of biometric attendance Mobile are as follows:

- Automate the process of recording student attendance using biometric authentication.
- Improve accuracy and reliability by dropping manual entry errors and proxy attendance.
- Provide real-time attendance data for effective monitoring and reporting.
- Enhance security by using biometric identifiers to verify student identity.

3. Identify the Stakeholders

Start by finding the key stakeholders who will be affected by the app, including business owners, users, and other decision-makers. Make sure to involve all relevant stakeholders in the requirements gathering process. Giving people a voice in the earliest stages of the project will also help with app adoption at the end of the project.

The key stakeholders involved in the biometric student’s attendance app project include:

- Lecturers/instructors: The professors and instructors who need accurate attendance data for academic purposes.
- Students: The end-users who will interact with the biometric system to record their attendance.
- Administrator (HOD): grant lecturers accounts creation.

4. Functional Requirements

4.1. User management

- Student registration: The application shall allow students to register using their student ID (matricule) and their email as well as the registration of their fingerprint. This will be achieved through a form, where each student will have to fill in and register for a course. When the form has been submitted, data will go to the backend and look for a matricule provided in the universities database in case it found a matching matricule it let student to associate their fingerprint to their account. In case of matriculation number not found, an error message is returned to the user (student).
- Lectures registration: the system shall allow lecturers to register through the system as admin by providing their names, ID, password, email, selecting the faculty, allow them to select the department, under which they can select the course. The system shall allow admin to create a section (course) they are teaching by selecting a course, the level, and then validate to create a new class. They shall see the students that registered for their courses. When setting up the time for attendance, the fingerprint pattern should be shown to let people authenticate themselves and sign the attendance.
- The system should support the registration and management of student profiles.
- Each student profile should include relevant information such as student matricule, name, and biometric data.
- The system should allow for adding, updating, and deleting student profiles.

4.2. Attendance Marking

- Student Attendance Marking: The application shall enable students to mark their attendance securely using fingerprint recognition. The verification process should be user-friendly and require minimal steps for students to complete attendance marking. Upon successful attendance marking, the application shall display a clear confirmation message with details like date, time, and course name.

4.3. Attendance Data

- Student Attendance Viewing: Students shall be able to view their attendance record in real-time. The attendance record shall display details such as date, time, course name, and attendance status (present, absent, late). Students may be able to view historical attendance data for a specific period (optional).

- Admin Attendance Access: lecturers ought to be able to access and export attendance data for their classes. The application may allow filtering and sorting of attendance data based on various criteria (e.g., date range, course, student name).

4.4. Biometric Authentication:

- The system should support fingerprint biometric authentication methods.
- The biometric authentication process should be fast (less than 5 seconds per student), accurate, and reliable.
- The system should provide feedback to students during the authentication process, indicating success or failure of account setting up.

4.5. Attendance Recording:

- The system should record the timestamp and relevant attendance information when a student successfully authenticates.
- The attendance records should be stored securely and be easily retrievable for reporting purposes.
- The system should handle multiple attendance sessions per day, such as lectures, tutorials, and labs.

5. Non-Functional Requirements (Technical requirements)

Here, we will have to define the technical requirements of the app, including the platforms, technologies, and infrastructure that will be used including requirements for scalability, performance, and security. While gathering these requirements should not be skipped, using a low-code cloud platform for development can simplify the implementation, as the right platform will check all the boxes.

The following non-functional requirements outline the desired qualities of the Biometric Student Attendance Mobile Application beyond its core functionalities:

5.1.Performance:

- Response Time: The application should provide quick feedback to user actions (e.g., registration, attendance marking) within an acceptable period (e.g., 2 seconds or less).
- Offline Functionality: The application should allow offline attendance marking. Locally stored data should synchronize with the server when an internet connection becomes available.
- Battery Consumption: The application should be optimized for low battery usage to minimize impact on mobile device battery life.

5.2.Usability

- User Interface (UI): The application should have a user-friendly and intuitive UI that is easy to navigate for users with varying levels of technical ability for students.
- Accessibility: The application should follow accessibility guidelines to ensure usability for individuals with disabilities (consider factors like text size adjustment, color contrast, and screen reader compatibility).
- Localization: The application interface and content should be adaptable to different languages to accommodate a diverse user base (optional)
- The biometric authentication process should be intuitive and require minimal training for users.
- The system should provide clear and informative error messages in case of authentication failures or system errors.

5.3.Reliability

- Availability: The application should be highly available with minimal downtime to ensure students and faculty can reliably record attendance.
- Data Integrity: The application should ensure the accuracy and consistency of attendance data throughout the entire process (from marking attendance to data storage and retrieval).
- Error Handling: The application should gracefully handle errors and provide informative messages to guide the user in case of issues during registration, attendance marking, or data synchronization.

5.4.Security

- Authentication: The application should implement strong authentication mechanisms for user login (students and faculty) to prevent unauthorized access and ensure the confidentiality and integrity of student biometric data.

- Data Security: Biometric data and student information should be encrypted both at rest (on the device) and in transit (during transmission) using industry-standard encryption algorithms.
- Authorization: The application should enforce access control mechanisms to ensure that only authorized users can perform specific actions (e.g., faculty initiating attendance sessions, viewing attendance data).

5.5.Maintainability

- The application code should be well-documented, modular, and follow coding best practices to ease future maintenance and updates.
- The application should be designed to accommodate future integration with other institutional systems (e.g., student information system) if needed.

5.6.Portability

The application should be developed using a cross-platform framework or approach to ensure compatibility with different mobile operating systems (iOS, Android) with minimal code modification.

5.7.Scalability:

- The system should be able to handle a large number of students and attendance transactions without performance degradation.
- The response time for biometric authentication and attendance recording should be minimal to avoid delays (less than 5 seconds).

6. Constraints and Considerations:

- Compliance: The biometric system should adhere to any legal and regulatory requirements about the collection and usage of biometric data.
- Hardware Compatibility: The system should be compatible with a range of biometric devices and sensors available on the market.
- Integration: The system should seamlessly integrate with existing university systems, such as student information systems or learning management systems, to streamline attendance management processes.

7. Additional features:

The application may offer functionalities like notifications for upcoming attendance sessions or reminders for students with low attendance.

The system may integrate with existing student information systems for automatic data synchronization.

CONCLUSION

As far as mobile app development is concerned, the requirement gathering should be taken into consideration. These requirements will serve as a foundation for the design and implementation of the system, ensuring a correct, efficient, and secure method of tracking student attendance.

REFERENCES

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